

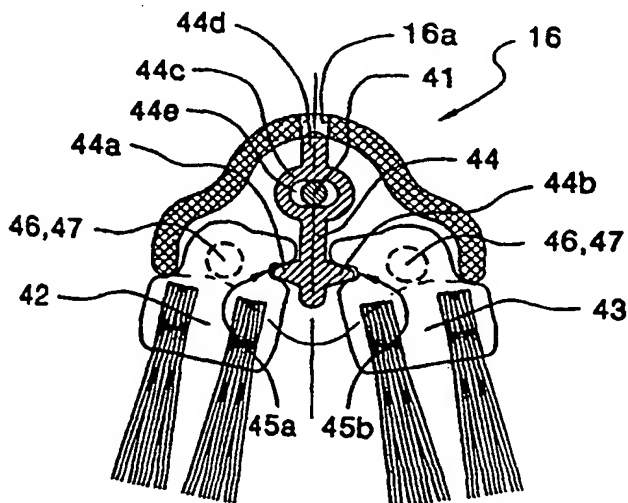
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

PCT

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BATTERY-POWERED TOOTHBRUSH



(57) Abstract: A battery-powered toothbrush has two bristle units in a toothbrush head which reciprocate the base and the tip of the teeth for brushing in a simple structure with a slim form and a detachable head bar. An elongated handle includes a rotation driving unit. A head bar has a bristle driving shaft rotated upon receipt of a rotational force from the rotation driving unit. The bristle driving shaft includes an eccentricity unit spaced apart from a first rotation axis line (Y). The bristle unit has a bristle support body onto which bristles are implanted, and the support body is rotatably and reciprocally moved centering around a second rotation axis line almost perpendicular to the lengthy direction of the teeth. A link is formed between the eccentricity unit and the bristle support body for shifting and transmitting the rotational movement of the eccentricity unit to a rotational and reciprocating movement of the bristle unit.

WO 01/43586 A1

BATTERY-POWERED TOOTHBRUSH

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to an battery-powered toothbrush, and more particularly, to an improved battery-powered toothbrush having two bristle units in a toothbrush head which reciprocate the base and the tip of the teeth for brushing in a simple structure with a slim form and a detachable head bar.

10

2. Description of the Background Art

There have been proposed various types battery-powered toothbrushes. Among them are an battery-powered toothbrush having bristles rotated centering around a rotating axis which is vertical to the tooth face and an battery-powered
15 toothbrush having a rotational shaft which is almost parallel to the row of teeth.

These battery-powered toothbrushes are mostly of a rotation type which require a reduction gear or have a structure allowing reverse-rotation. Accordingly, they inevitably have a complicate structure inside the head bar or for a driving unit.

Besides, in case of the battery-powered toothbrush having bristles rotated
20 centering around a rotational axis, since the rotation central axis of the bristles is to be at a certain angle to the head bar, its construction is complicated.

In addition, the relative movement between the tooth face and the bristles is different from the way in which a general toothbrush is moved for brushing.

In case of the battery-powered toothbrush having the rotational axis which
25 is almost in parallel to the row of teeth, which has cylindrical type bristles (i.e.,

toothbrushes as disclosed in Korean Laid Open No. 99-24569, Korean Utility Model Laid Open No. 84-607, Korean Laid Open No. 91-2400, Korean Utility Model Laid Open No. 94-6991), a switching unit or speed reduction is required. Besides, its bristle unit is too large.

5 In case where the size of the bristle unit is reduced, its strength becomes great as the bristles are shortened, possibly resulting in damaging gums.

Thus, development of an battery-powered toothbrush having a small size bristle unit is in demand which also allows users to brush their teeth in the similar method to the general brushing method. In addition, an battery-powered
10 toothbrush having a simple driving force transmission structure is in demand.

SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide an battery-
15 powered toothbrush having two small bristle units and simple structure.

Another object of the present invention is to provide an battery-powered toothbrush having a structure that a plurality of head bars can be changeably assembled with a single elongated handle for use.

To achieve these and other advantages and in accordance with the
20 purpose of the present invention, as embodied and broadly described herein, there is provided an battery-powered toothbrush having an elongated handle and a head bar combined with the elongated handle which allow bristles to be reciprocally moved along the lengthy direction of the teeth for brushing, wherein the elongated handle includes a rotation driving unit, and the head bar has a
25 bristle driving shaft which is rotated upon receipt of a rotational force from the

rotation driving unit, the bristle driving shaft including an eccentricity unit spaced apart from a first rotation axis line (Y), a bristle unit having a bristle support body onto which bristles are implanted, the support body being rotatably and reciprocally moved centering around a second rotation axis line almost perpendicular to the lengthy direction of the teeth, and a link is formed between the eccentricity unit and the bristle support body for shifting and transmitting the rotational movement of the eccentricity unit to a rotational and reciprocating movement of the bristle unit.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Figure 1 is a perspective view of an battery-powered toothbrush in accordance with the present invention;

Figure 2 is a plan view of the battery-powered toothbrush of Figure 1, showing a section of a part of the toothbrush in accordance with the present invention;

Figure 3 is a side view of the battery-powered toothbrush of Figure 1, showing a section of a part of the toothbrush as disassembled in accordance with the present invention;

Figure 4A is a sectional view of a head of the toothbrush when the bristles of the battery-powered toothbrush of Figure 1 are positioned at the upper and the lower gums in accordance with the present invention;

Figure 4B is a sectional view of a head of the toothbrush when the bristles of the battery-powered toothbrush of Figure 1 are positioned at the ends of the upper and the lower teeth in accordance with the present invention; and

Figure 5 is a sectional view of the part of a bristle unit installed at the battery-powered toothbrush of Figure 1 in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

Figure 1 is a perspective view of an battery-powered toothbrush, Figure 2 is a plan view of the battery-powered toothbrush, and Figure 3 is a side view of the battery-powered toothbrush as disassembled. Figures 2 and 3 shows the inner structure of the toothbrush by partially cutting it.

With reference to Figures 1 through 3, an battery-powered toothbrush includes an elongated handle 12 and a head bar 14. The head bar 14 is detachably attached to the elongated handle 12. There is provided a head portion 16 at the end of the head bar.

The elongated handle 12 is made of an elongated handle body 13 which

includes a rotation driving unit 20 and a circuit unit 21.

A switch cover 22 is assembled at the middle portion of the elongated handle body 13.

As shown in Figure 3, the switch cover 22 is formed of a film 23 of having
5 an elasticity of a plastic resin at its outer side thereof, and a wall of a plastic resin is formed inside the film 23. The center of the film 23 is protruded, and a hole 25 is formed at the wall portion corresponding to the center of the film 23. The switch cover 22 is fabricated in a so-called in-mold injection molding method.

The end of the body 13 is clogged with a round shape bottom cap 26. A
10 hole 27 is formed at the center of the cap 26. The cap 26 is fixed at the lower end of the body 13 by an elastic protrusion 28 in a so-called snap fit combining method. The driving unit 20 installed in the body 13 includes a motor 35 and a rotation transmission shaft 37.

The motor 35 is provided with a motor shaft 36. The motor shaft 36 and
15 the rotation transmission shaft 37 are connected by a coupling 38. The coupling 38 is made of an engineering plasmatic material. The shafts 36 and 37 are press-fit to the coupling 38.

A circuit unit 21 is provided to rotate and control the motor 35, including a charging unit and a controller. The charging unit includes a battery 30 and an
20 induction coil 31 for receiving power charged from an external source wirelessly. An additional charging unit (not shown) also includes an induction coil. An AC is induced to the induction coil 31, which is changed to a DC in the circuit of the charging unit and charged in the battery 30.

The controller supplies a current to the motor and the motor is rotated
25 according to user's manipulation of the switch 32. The switch 32 is mounted on

the circuit board 33.

The switch 32 includes contact points 32a and 32b, and the contact point 32a is positioned at the end of a plate spring 34. The contact points 32a and 32b are separated at ordinary times. Being depressed, the contacts points are connected, and when the force for depressing is released, they are again separated by the restoring force of the plate spring 34.

The circuit is constructed in that when the switch 32 is depressed and released, the motor 35 is operated, and when the switch 32 is depressed and released, the rotation of the motor 35 is stopped.

As noted in Figure 3, the central protrusion of the switch cover 22 corresponds to the contact point 32a of the switch 32.

The circuit components of the charging unit and the controller are disposed on the circuit board 33.

With reference to Figures 1 through 3, the head bar 14 includes a head bar body 15. The head bar body 15 is detachably combined with the elongated handle body 13 of the elongated handle 12. A groove 15a at the lower end portion of the head bar body is designed into which the protrusion 13a provided at the upper end of the elongated handle body 13 is tightly inserted.

The rotation transmission shaft 37 is connected with the motor shaft 36 by the coupling 38 of the main body and smoothly rotated. When the head bar 14 is connected with the elongated handle 12, the rotation transmission shaft 37 is combined with a bristle driving shaft 40 by the coupling 39 of the head bar and transmits the rotational force.

The connections in this respect will now be described in detail.

The rotation transmission axis 37 has a cylindrical form. Its lower portion

37b is partially in a semi-cylindrical shape and press-fit to the coupling 38 of the main body, while its upper portion 37a is also in a semi-cylindrical shape, having a coupling flat surface 37d and an angled groove 37c at the circumferential face so as to be detachably fit the coupling 39 of the head bar.

5 The coupling 39 of the head bar includes a groove 3a into which the semi-cylindrical upper portion 37a, the coupling flat face 39d to be adjusted with the semi-cylindrical upper portion and a protrusion 39c to be inserted into the groove 37c.

 The groove 37a of the upper portion 37a of the rotation transmission shaft
10 37 and the protrusion 39c prevents the head bar 14 and the elongated handle 12 from separating, which runs counter to the user's intention, and strengths their binding.

 In addition, in order to prevent an insertion resistance at the upper portion 37a of the rotation transmission axis 37 due to a foreign material or the air
15 resistance, the end of the upper portion 37a of the rotation transmission shaft is inclined and the inner side of the coupling 39 is also inclined for an easy insertion.

 The bristle driving shaft 40 is rotatably supported by the inner wall of the head portion 16.

 Driving force transmission elements from the motor 36 to the bristle driving
20 shaft 40 are sequentially disposed on the same rotational axis line (Y).

 The bristle driving shaft 40 includes an eccentricity unit 41 isolated as far as a predetermined distance from the rotation axis line (Y). The eccentricity unit 41 is rotated centering around the rotation axis line (Y), and the rotational movement of the eccentricity unit 41 is switched to a reciprocal movement of a link 44 so that
25 two bristle units 42 and 43 are rendered to brush the teeth.

With reference to Figures 4A and 4B and 5, the eccentricity unit 41 is inserted at one end portion of the link 44, and there are provided a ring type bushing 44c having the guide hole 44e having a long slit form extended in the vertical direction to the lengthy direction of the link, and a protrusion 44d for
5 guiding the linear reciprocal movement in the lengthy direction of the link 44.

A guide hole 16a is provided at the head portion 16 so that the protrusion 44d of the link 44 is can be smoothly reciprocated. The protrusion 44d is formed sufficiently long not so as to be released from the hole.

Two protrusions 44a and 44b are provided at the other end portion of the
10 link 44, which are extended in the vertical direction to the lengthy direction of the link. The two protrusions 44a and 44b are inserted into grooves 45a and 45b formed at the middle portion of a support 45 of the bristle units 42 and 43, being engaged with each other like a rack and a pinion of a gear, so as to transmit the rotation movement transmitted along the rotation axis line (Y) to the two bristle
15 units 42 and 43.

The first protrusion 44a is engaged with the first bristle unit 42 and the second protrusion 44b is engaged with the second bristle unit 43.

With reference to Figure 5, the two bristle units 42 and 43 include the bristle support 45. Two support grooves 48 and 49 are formed into which the first
20 support shaft 46 protruded from the head portion 16 and the second support shaft 47 are inserted, respectively.

The bristle units 42 and 43 are rotatably reciprocated repeatedly as long as a certain angle centering around the bristle unit rotation axis line formed by the support shafts 46 and 47. The bristle unit rotation axis line is about perpendicular
25 to the length direction of the teeth.

In the bristle units 42 and 43, the bristles 50 are implanted onto the support 45. The bristles are disposed by 6 lines at equal intervals. Of course, the bristles are not necessarily disposed in 6 lines and may be disposed in a more or a less lines. In addition, the height of the bristles 50 may be varied depending on
5 the position in each line.

According to the construction of the link as described above with reference to Figures 4 and 5, when the eccentricity unit 41 is rotated centering around the rotation axis line (Y), it is guided by the guide hole 44e to reciprocally move the link in the lengthy direction, according to which the bristle units are rotatably and
10 reciprocally moved repeatedly.

The operation of the battery-powered toothbrush of the present invention constructed as described above will now be explained with reference to the accompanying drawings.

First, when the central portion of the switch cover 22 is depressed, the
15 motor 35 is driven and the motor shaft 35 is rotated. The rotation of the motor shaft 36 is transmitted to the rotation transmission shaft 37 and the bristle driving shaft 40. The rotation of the bristle driving shaft 40 is shifted to a reciprocal movement of the link 44 by the eccentricity unit 41, according to which the two bristle units 42 and 43 into which the protrusions 44a and 44b of the link 44 have
20 been inserted are reciprocally and rotatably moved for brushing.

Several head bars 14 may be changeably inserted into the elongated handle 12 of the battery-powered toothbrush 10. Then, with only one elongated handle, several family members can use the battery-powered toothbrush by using their own head bar 14.

25 In the above described preferred embodiment, the battery and the

induction coil are provided for being charged, to which the charging battery (a secondary electric battery) supplies an electric power. Unlikely, however, the primary battery (a battery) may be used. Probably less preferred because of an electric shock, however, a wired charging method may be adopted instead of the wireless charging method according to the induction coil.

As so far described, according to the battery-powered toothbrush of the present invention, when a user brushes his or her teeth with the battery-powered toothbrush, brushing is performed along the axis line (called the tooth lengthy direction) connecting the base and the tip of the teeth in the same manner as the general brushing. In spite of having the two bristle units, the head portion is formed in the small size.

In addition, in spite of having the two bristle units, since the driving force transmitting mechanism has the simple structure, having an effect that the head bar feels slim and the weight of the battery-powered toothbrush itself can be reduced. This would solve any inconvenience of the user and certainly help children to use.

Moreover, the two bristle units are reciprocated in the opposite directions to evenly brush the upper teeth and the lower teeth. Also, since several head bars can be changeably installed at the single elongated handle, so that family members can advantageously use the battery-powered toothbrush.

Furthermore, by using the in-mold injection-molded switch, the depressing touch of the switch is improved, and permeation of water can be prevented.

As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the

details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the meets and bounds of the claims, or equivalence of such meets and bounds are therefore intended to
5 be embraced by the appended claims.

What is claimed is:

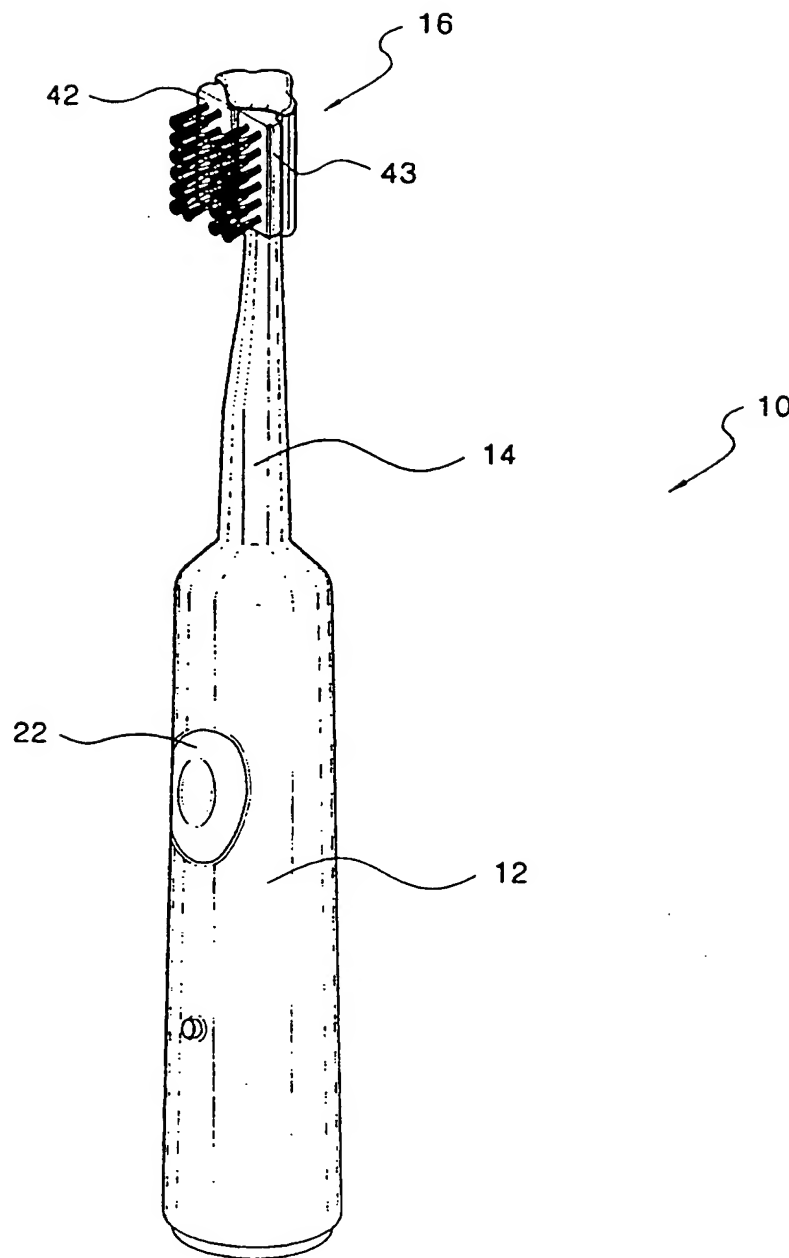
1. An battery-powered toothbrush having an elongated handle and a head bar combined with the elongated handle which allow bristles to be reciprocally moved along the lengthy direction of the teeth for brushing,
5 wherein the elongated handle includes a rotation driving unit, and
the head bar has a bristle driving shaft which is rotated upon receipt of a rotational force from the rotation driving unit, the bristle driving shaft including an eccentricity unit spaced apart from a first rotation axis line (Y), a bristle unit having
10 a bristle support body onto which bristles are implanted, the support body being rotatably and reciprocally moved centering around a second rotation axis line almost perpendicular to the lengthy direction of the teeth, and a link is formed between the eccentricity unit and the bristle support body for shifting and transmitting the rotational movement of the eccentricity unit to a rotational and
15 reciprocating movement of the bristle unit.
2. The battery-powered toothbrush of claim 1, wherein the head bar includes a pair of bristle units, grooves are formed at the side facing the support bodies of each bristle unit, the link includes two protrusions at one end thereof to
20 be engaged with the grooves and a bushing having a hole into which the eccentricity unit is inserted at the other end thereof.
3. The battery-powered toothbrush of claim 1 or 2, wherein the head bar and the elongated handle are detachably attached.

4. The battery-powered toothbrush of claim 3, wherein the elongated handle includes a rotation driving shaft connected to the rotating driving unit, the head bar includes a coupling for connecting the bristle driving shaft and the rotation driving shaft, the coupling having a groove into which the rotation driving shaft is inserted, and the groove and the rotation driving shaft includes a combining protrusion and a combining groove, respectively.

5. The battery-powered toothbrush of claim 1 or 2, wherein the elongated handle includes a switch for controlling an operation of the rotation driving unit therein and a switch cover for covering the switch, the switching cover includes a film layer having an elasticity of a plastic resin and a resin layer which is in-mold injection-molded and formed at the lower portion of the film layer, and a hole is formed at the resin layer where a portion of the switch is positioned so that the switch can directly contact the film layer.

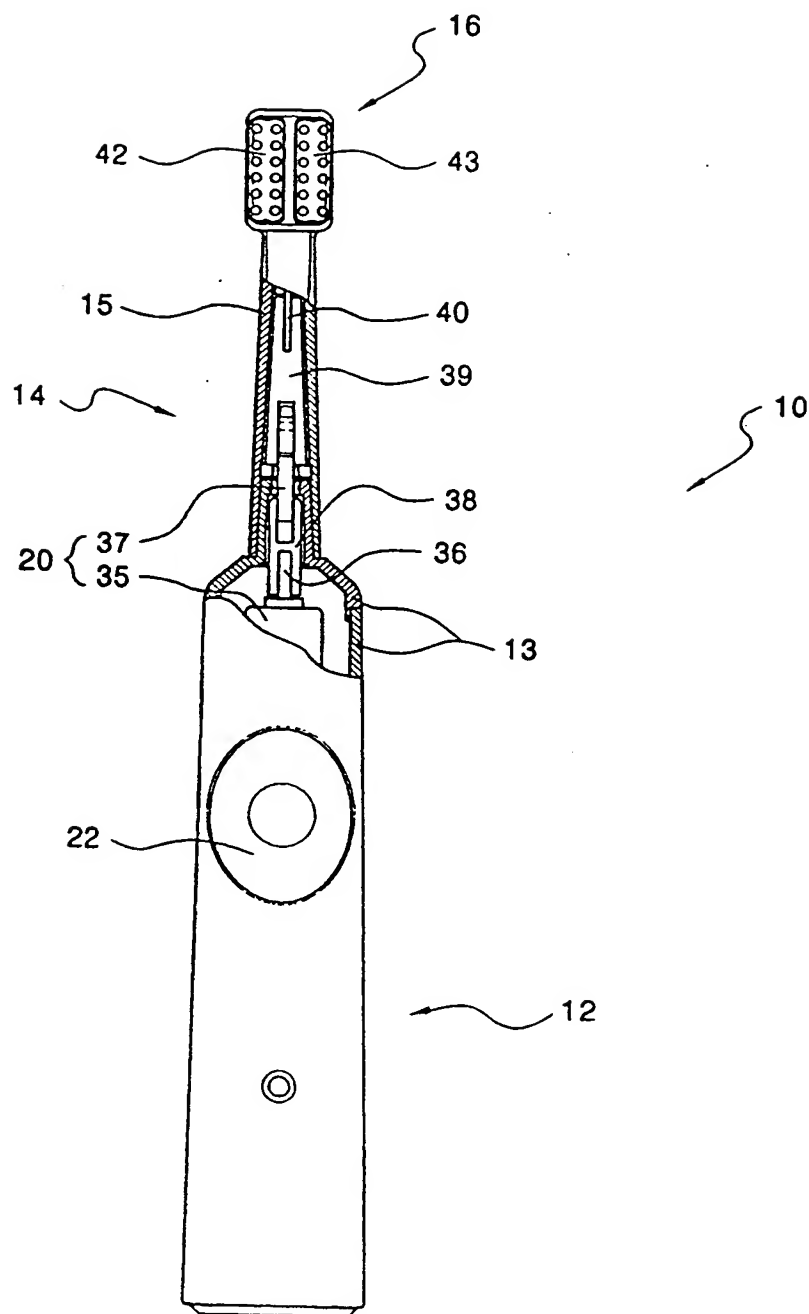
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Fig. 1



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Fig. 2



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Fig. 3

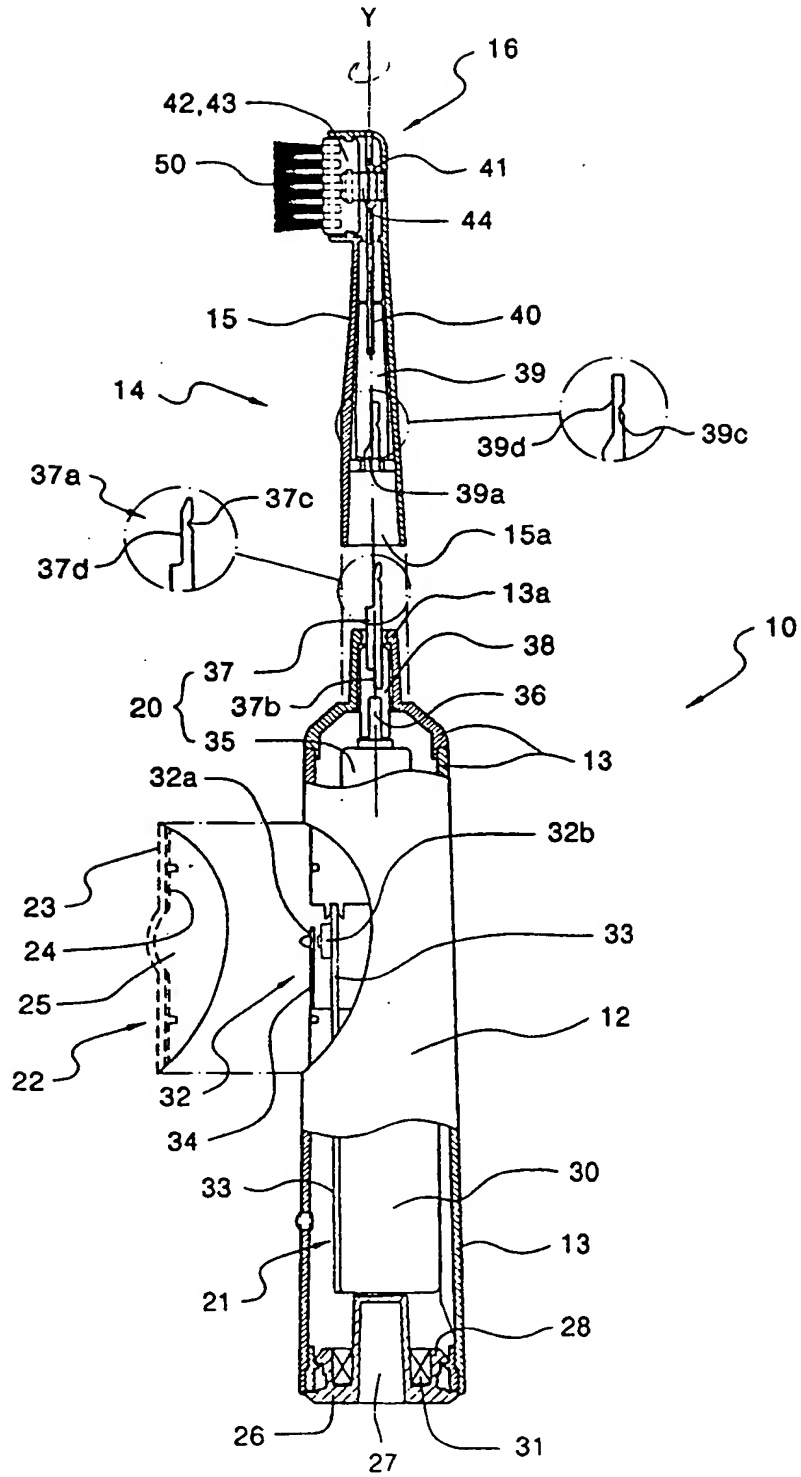
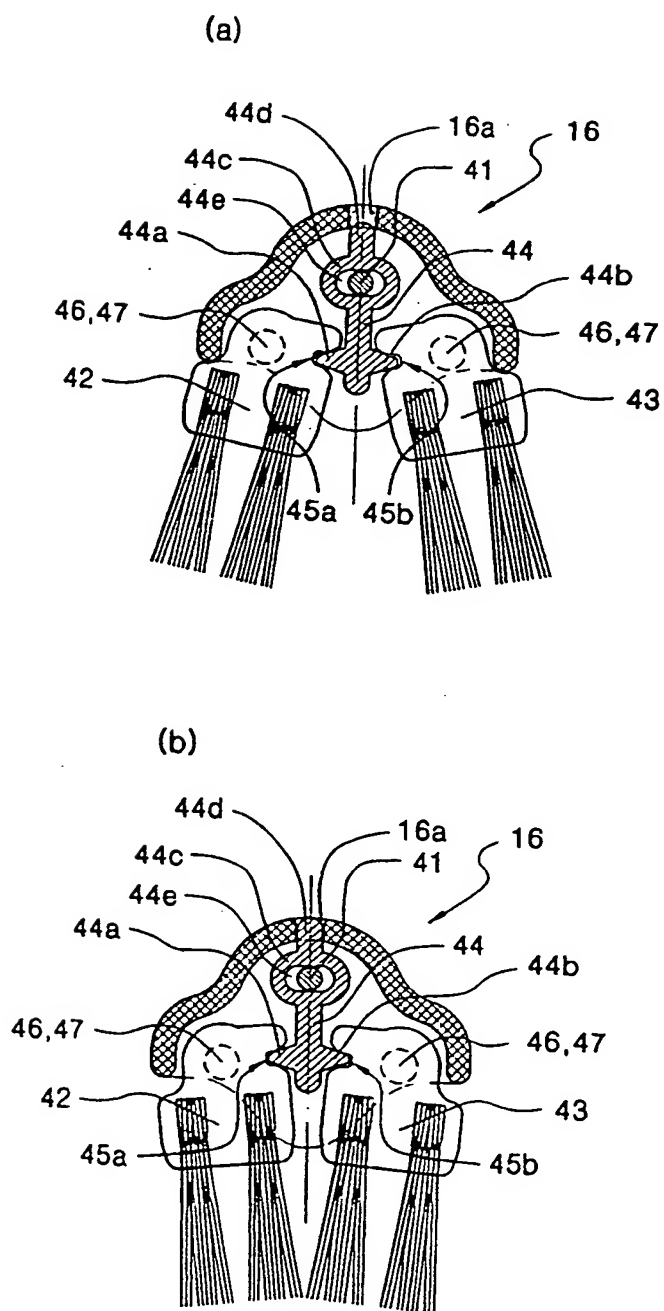
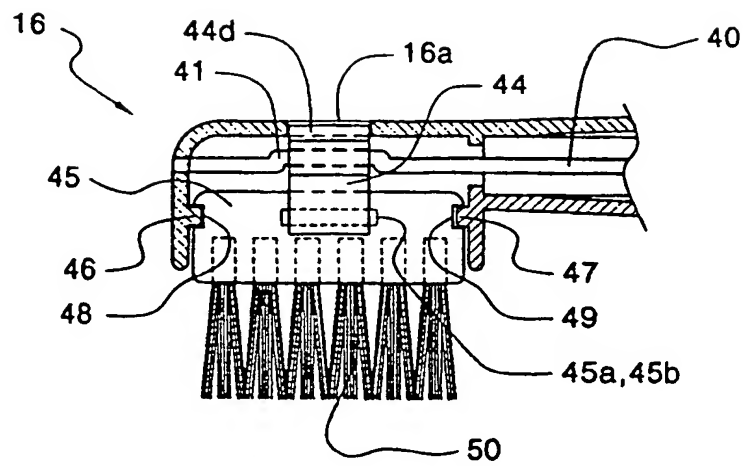


Fig. 4



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Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR00/01477

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 A46B 13/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC A46B 13/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR, IPC as above

JP, IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP. A. 54-38851 (MORIYAMA TOSHIO) 24 March 1979 (24. 03. 1979) see claims; Fig. 7, 8.	I
A	JP. A. 6-343513 (PHILIPS ELECTRON NV) 20 December 1994 (20. 12. 1994) see the whole document; Fig. 1, 3, 6.	I - 5
A	US. A. 5 689 850 (AVRAHAM SHEKALIM) 25 November 1997 (25. 11. 1997) (Family: none) see the whole document; Fig. 1.	I
A	US. A. 4 995 131 (HIROSHI TAKETA) 26 February 1991 (26. 02. 1991) see the whole document; Fig. 1, 3, 5.	I - 5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

03 APRIL 2001 (03.04.2001)

Date of mailing of the international search report

04 APRIL 2001 (04.04.2001)

Name and mailing address of the ISA/KR

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Government Complex-Taejon, Dunsan-dong, So-ku, Taejon
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Authorized officer

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR00/01477

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		DE-A-2838015	15-03-79
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JP-A-6-343513	20-12-94	EP-A- 628291	14-12-94
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		FR-A-2639535	01-06-90
		GB-A-2225712	13-06-90
		JP-A- 2142508	31-05-90
		NL-A-8902908	18-06-90
		SE-A-8903954	26-05-90

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